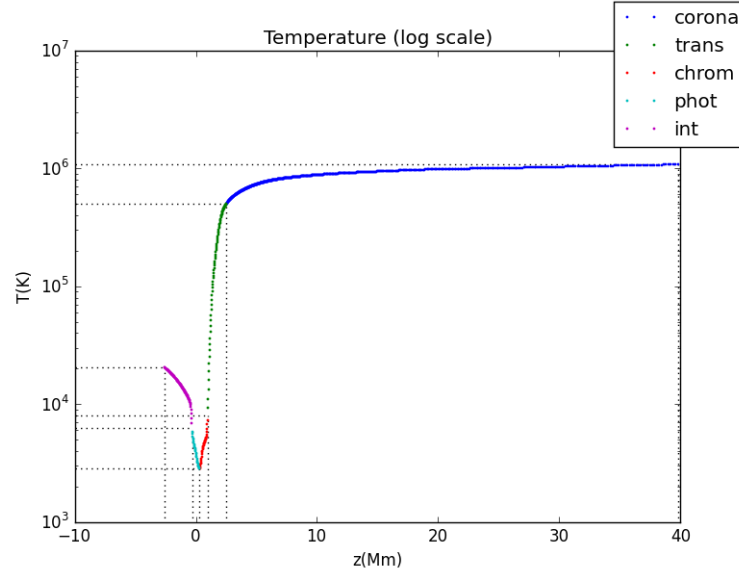**1**  a)



Figura 1: *Temperature vs z plot. logarithmic y scale*

Temperature layers (from top to bottom), interval of temperatures measured in K and code conditions from: `http://www.nasa.gov/mission_pages/iris/multimedia/layerzoo.html`

corona between [39.802200, 2.535930] Mm temperatures: [1.080180e+06, 5.025160e+05] K ($\geq 500000$)

transition region between [2.516350, 0.991115] Mm temperatures: [4.991350e+05, 8.067640e+03] K ([50000, 8000))

chromosphere between [0.971556, 0.305708] Mm temperatures: [7.306160e+03, 2.843670e+03] K ([8000, $min(temperature)$)])

photosphere between [0.286093, -0.303487] Mm temperatures: [2.848470e+03, 6.297540e+03] K (($min(temperature)$), 6500])

solar interior between [-0.323184, -2.592960] Mm temperatures: [6.837750e+03, 2.068340e+04] K ($> 6500$)

**1**  b)

$\mu = \frac{n_H + 4n_{He}}{n_e + n_H + n_{He}}$

- totally ionized H and He $\implies n_e = n_H + 2n_{He} \implies \mu = \frac{n_H + 4n_{He}}{2n_H + 3n_{He}}$

  $n_H = 10 n_{He} \implies \mu = \frac{14}{23} = 0.6087$

- neutral H and He $\implies n_e = 0 \implies \mu = \frac{n_H + 4n_{He}}{n_H + n_{He}}$

  $n_H = 10 n_{He} \implies \mu = \frac{14}{11} = 1.2727$

$n_{He} = \frac{1}{10} n_H \implies \mu = \frac{n_H + \frac{4}{10} n_H}{n_e + n_H + \frac{1}{10} n_H}$

$\implies \mu(1 + \frac{11}{10} \frac{n_H}{n_e}) = \frac{14}{10} \frac{n_H}{n_e}$

$\implies \frac{n_H}{n_e} = \frac{\mu}{1.4 - 1.1\mu}$

In the graphic(data from file) we can see the constant value in the corona of $\frac{n_H}{n_e} = 0.843 \approx= \frac{5}{6}$ which is the value we calculate in the case of totally ionized H and He and we expect this
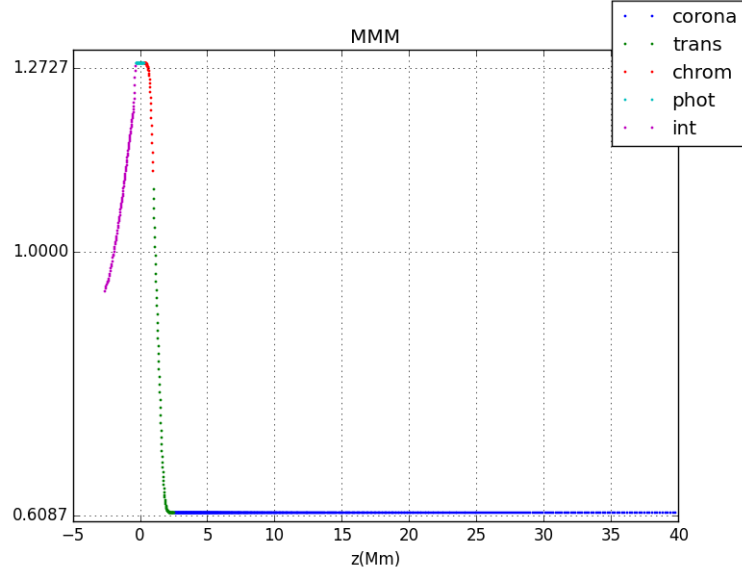
Figura 2: *Mean molecular weight(g/mol) vs z plot* Upper limit close 1.2727 $= \mu$ in the case of neutral H and He, lower limit close to 0.6087 $= \mu$ calculated in the case of completely ionized H and He
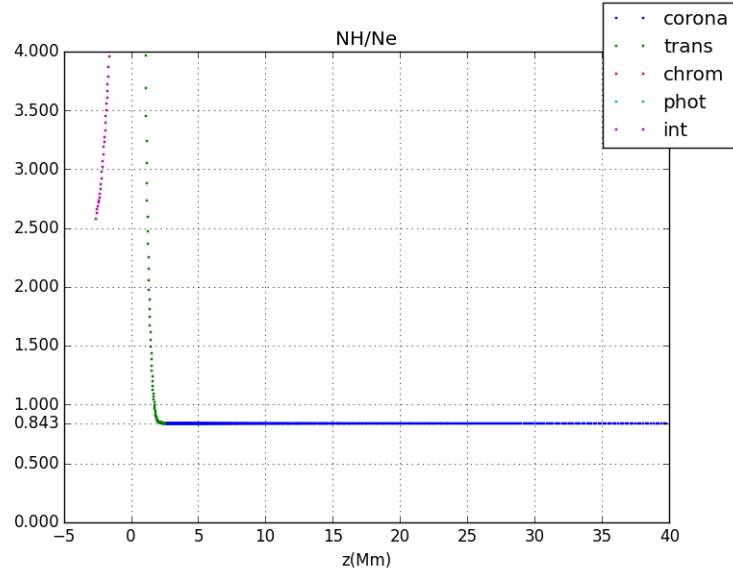


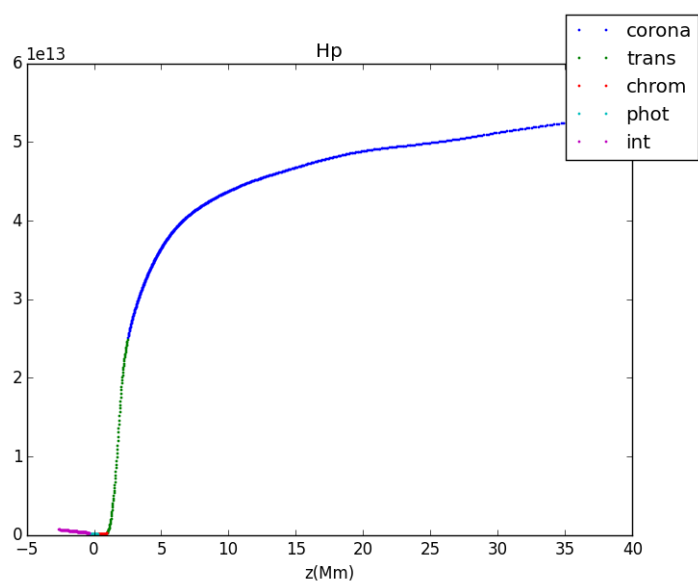Figura 3: number of atoms of H / number of electrons
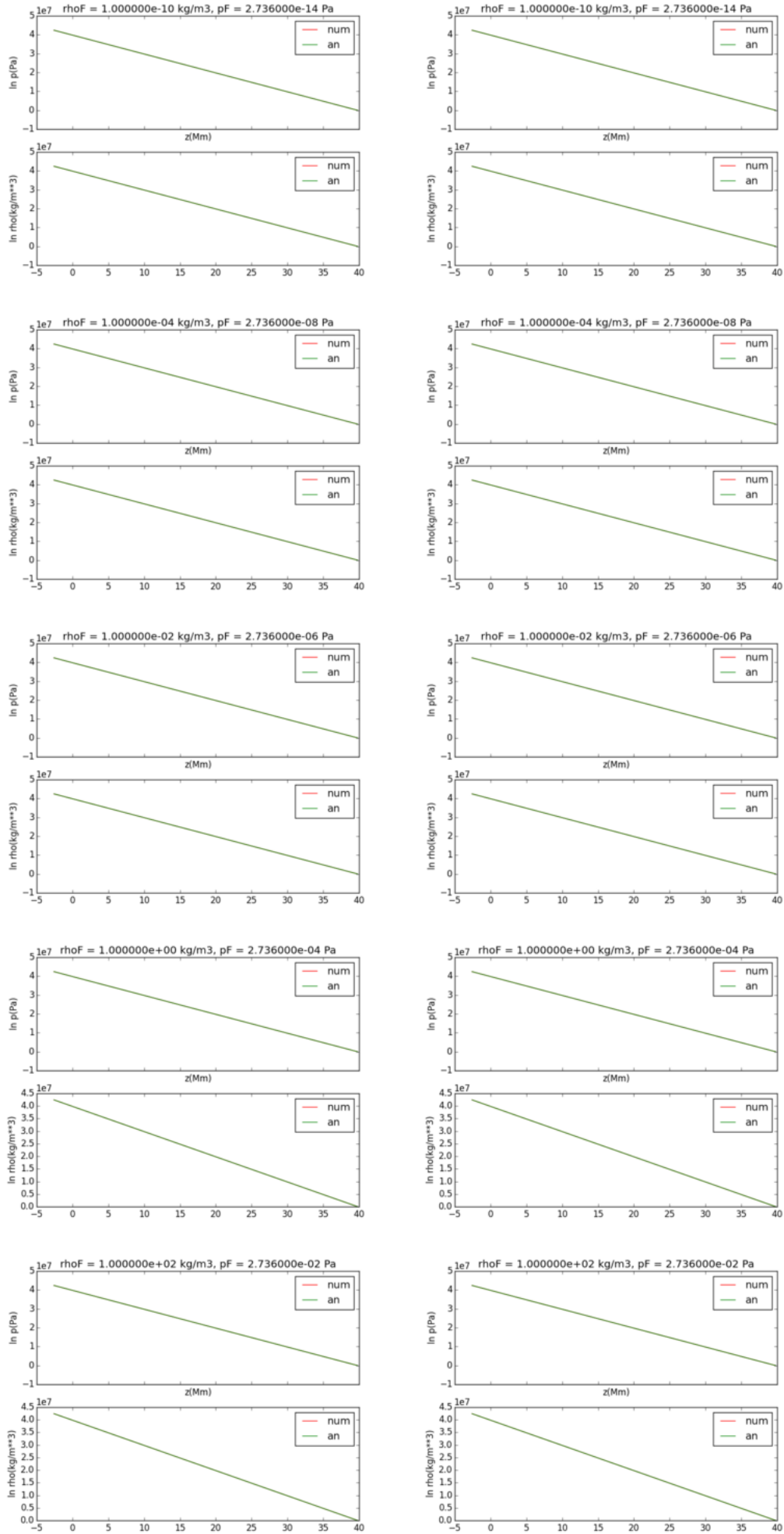
Figura 4: Pressure scale height

Figura 5: Analytic test
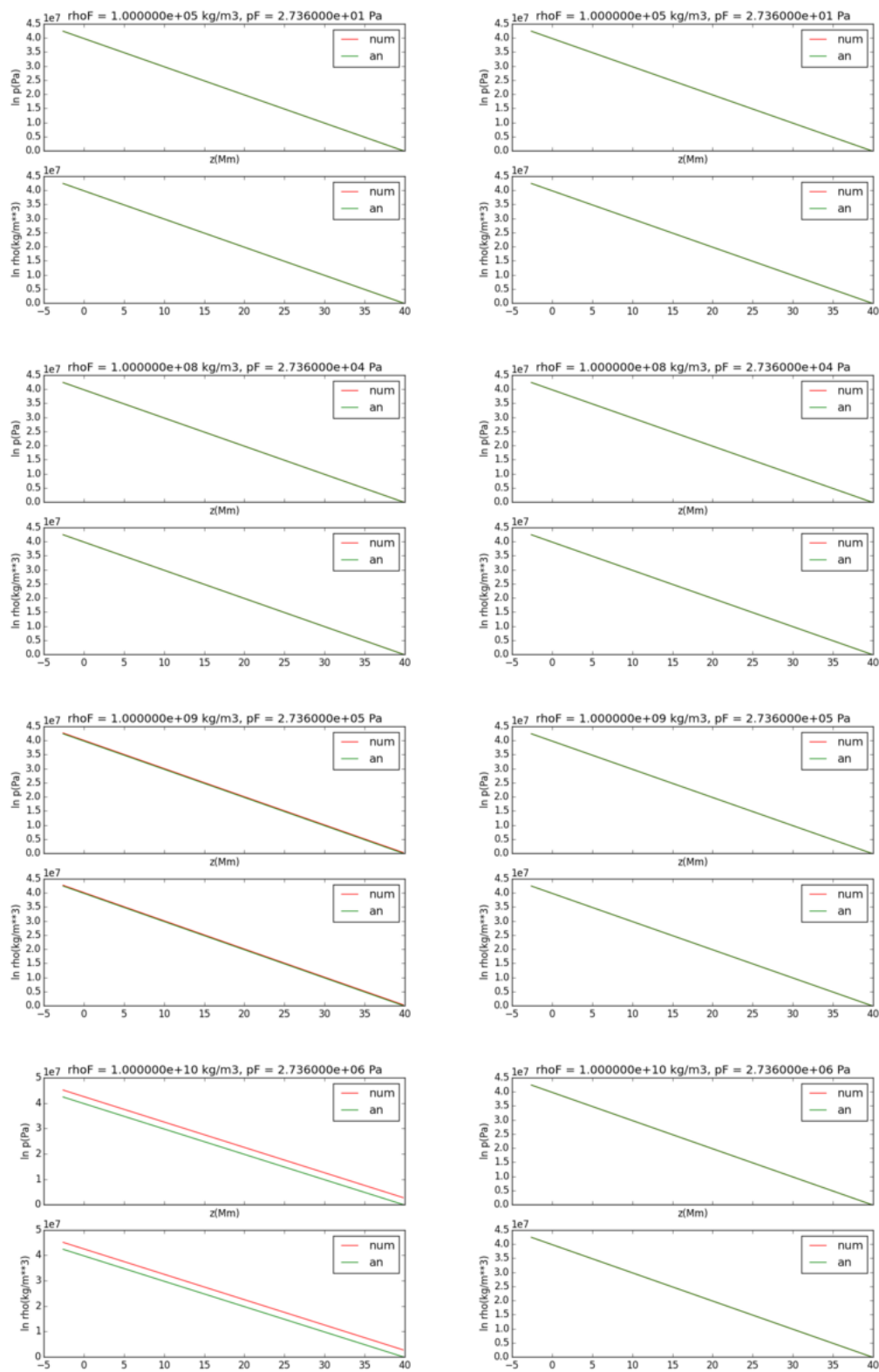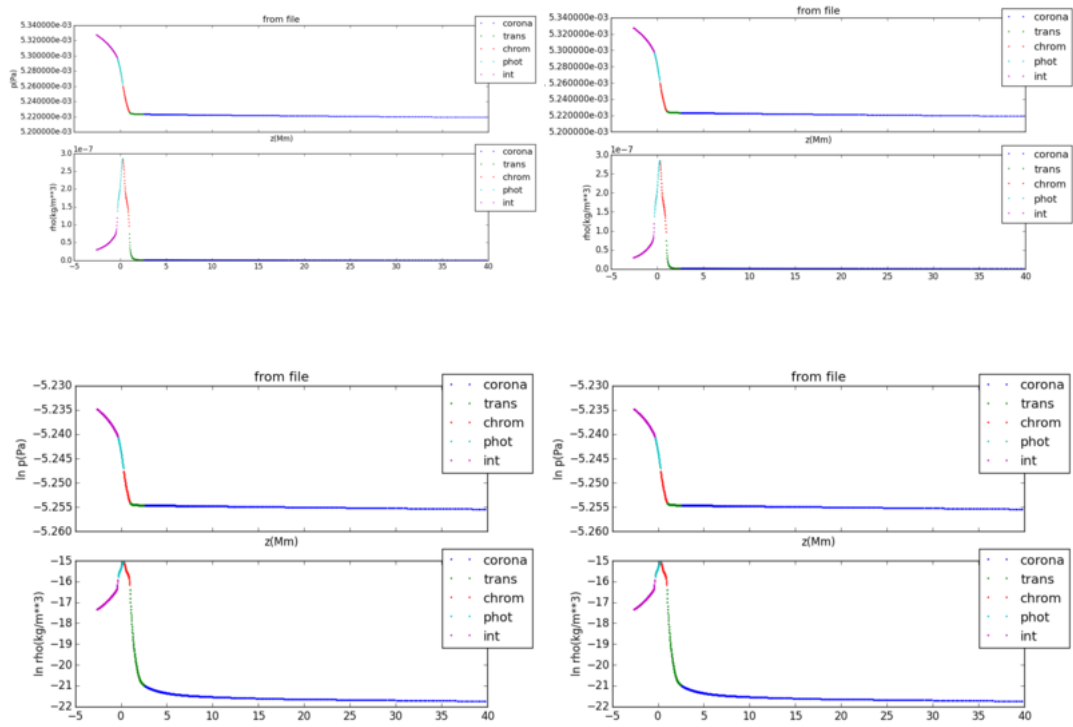
Figura 6: Analytic test

Figura 7: top pres and density, bottom ln (pres) and ln (density), left outward - inward integration, right inward - outward integration